This policy is dividing public-health scientists in the country. Many French general practitioners are among those who argue that the measure is authoritarian and could backfire, not least by alienating parents and increasing wariness of vaccines in a country where various health scandals (most infamously, HIV-infected blood transfusions given in the early 1980s to people with haemophilia) have spread mistrust of health authorities.

Misguidedly, authorities seem to think that the new law is a pertinent response to scare stories about the safety of childhood vaccines, in particular, those told by anti-vaccine groups. Countering such misinformation is important, but does not alone constitute the basis for a coherent vaccine policy. Data on vaccine coverage of most diseases in France show that the situation is now better than it has been in years. Coverage rates for some newer vaccines are too low, but have nonetheless been increasing; the rates of meningitis-C vaccination, for example, have steadily increased since it was introduced a decade ago, from just 48% among 2 year olds at the end of 2011 to 71% in 2016. But vaccine coverage in France for most diseases is high overall. The challenge is rather to develop policies that will get the stragglers vaccinated to ensure that enough of the population is immunized to surpass the thresholds needed for herd immunity.

To portray societal hesitation about vaccination as a simple battle between anti-vaccine groups and ignorant populations on the one side, and scientific reason and public health on the other — as the French government has done — promotes an unproductive and sterile controversy, and a simplified view that obscures complex issues, such as the multiple causes of 'vaccine hesitancy' in populations, and the fundamental role of building trust in health-care institutions and information from government and scientists.

One of the biggest practical problems that France faces is the often poor follow-through of booster shots. Health data show that only eight in ten babies get the MMR booster (for mumps, measles and rubella) due at 18 months of age — a lower rate than in many other countries, and a problem because it weakens herd immunity in the population.

This has no-doubt contributed to a slight recrudescence of measles in the country, with a few dozen to a few hundred cases annually — and in particular, to an epidemic of several thousand cases in 2010 and 2011. But the French government's reaction of making childhood vaccines mandatory is simplistic, and reneges on the administration's greater responsibility to work patiently hand in hand with health-care workers and the public to improve what is already high take-up of vaccines. Multiple studies show that simple reminders — text messages among them — of when vaccines and booster shots are due can have a big impact on compliance and coverage. The same is true of national electronic vaccine-information systems to track people's vaccinations, an area in which much progress remains to be made.

"The challenge is to develop policies that will get the stragglers vaccinated."

To its credit, the French government has pledged to review annually the compliance and impact of the new law. But in a country where '*liberté*' is one of the three pillars of the national motto, the heavy-handed law could do something that nobody involved wants: fuel further unfounded resistance to life-saving vaccines. Making vaccines mandatory should be at most a stopgap. The only sustainable policy is for the government to put its efforts into making a strong case to the public about the benefits of vaccinations, and to better use the available evidence to implement more proactive strategies that can extend already respectable coverage rates for most diseases to those vaccines that are lagging. ■

Electoral plot

Maths helps to catch Republican politicians who unfairly fiddled with voting districts.

Mathematicians are no longer devices for turning coffee into theorems, as the Hungarian mathematics researcher (and caffeine addict) Alfréd Rényi is said to have claimed. They seem pretty useful for preserving democracy, too. In striking down the way that officials in North Carolina unfairly partitioned the state into electoral districts, a US federal court last week conspicuously cited the work of mathematicians including Jonathan Mattingly, an expert in mathematical modelling.

In a 200-page decision released on 9 January, the three-judge court in Richmond, Virginia, said that the districting had unfairly favoured the Republican Party. Maths played a key part in helping the court to reach that decision, by demonstrating the unlawful use of partisan gerrymandering — fiddling with district boundaries to include or exclude certain voters and steer the results of an election. Those apportioning districts might draw borders that pack large numbers of voters for an opposition party into a small number of districts, for example, limiting the number of seats that the opposition can win. The process has been likened to allowing lawmakers to choose their voters, rather than the other way around.

Mattingly, a researcher at Duke University in Durham, North Carolina, used his expertise to argue that the state districts were drawn up to give Republicans an unfair advantage. To do so, he used an algorithm that produced around 24,000 maps of marginally different district configurations that were randomly drawn on the basis of geographic criteria. The Republican-drawn boundaries, which had delivered 9 Republicans to the state's 13 seats in the House of Representatives in Washington DC in 2012, were more gerrymandered than practically every single one of Mattingly's algorithm-derived maps. Using the same voting data, his maps nearly all gave a larger number of wins to the Democratic Party and, in many cases, gave it the majority.

Mattingly had taken an interest in the process after the 2012 elections and was called to testify after two advocacy organizations sued the state in federal court following the 2016 elections. In October, they asked Mattingly to take the stand and explain his work and its implications. He was ready: by then, he and his collaborators had done more-recent studies of the state's current redistricting, engineered in 2016 by the Republican majority in the North Carolina General Assembly.

Some of the modelling is preliminary, but it has had a historic impact: last week's ruling was the first time that a US federal court has struck down electoral districting for favouring one political party over another. (Previous rulings have done so for other reasons, such as racial disparities.) Gerrymandering is not exclusive to North Carolina, or to the US Republican Party. Courts have struck down pro-Democratic redistricting in Maryland, for example, and similar cases are being debated in the United Kingdom and elsewhere.

Last week's ruling is not the final word on North Carolina's system. The General Assembly has filed an appeal, and the case is likely to end up in the US Supreme Court. The court has ruled in the past that politically motivated gerrymandering was illegal, but also that there were no objective metrics to establish it.

But that is what Mattingly and others have been working to change — and the computer simulations could be needed more than ever. The upcoming 2020 US census will trigger widespread redrawing of electoral districts, and there are already concerns that gerrymandering will be rife.

Mattingly and other academics who study electoral systems are organizing to train their colleagues on the science of gerrymandering, and how to communicate it to a non-mathematical audience. One summer camp held last year had planned for 50 attendees; more than 1,000 applied. That's a lot of coffee — and all of it consumed in a good cause. ■